ISGS 1950-A
C.2

S
14. GS:
GUL 1950-A
C. 2

ILLINOIS STATE
GEOLOGICAL SURVEY
LIBRARY

c.2

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
STATE GEOLOGICAL SURVEY DIVISION

Morris M. Leighton, Chief

CHESTER AREA

Randolph County

Guide Leaflet 50-A

by
Gilbert O. Raasch

ILLINOIS STATE
GEOLOGICAL SURVEY
LIBRARY

Urbana, Illinois
April 8, 1950

Digitized by the Internet Archive
in 2012 with funding from
University of Illinois Urbana-Champaign

http://archive.org/details/chesterarearando1950raas

PART I. ITINERARY

0.0 0.0 Assemble opposite Chester Community High School.

0.0 0.0 Proceed ahead (NE).

0.2 0.2 Stop Sign; Route 150. Turn right (SW) on No. 150.

0.7 0.9 Stop Sign; junction with Route 3 in Chester. Continue ahead (SW) on 150-3.

0.2 1.1 Route 3 turns left; continue ahead on Servant Street.

0.6 1.7 Turn left (SW) at Court House and descend steep hill.

0.7 2.4 Railroad crossing. Turn left (SE) along river road.

1.2 3.6 STOP No. 1. Bluff and quarry in Chester strata.

The Chester Group is the name given to the upper division of the Mississippian System (see geologic column). In Chester time, this region was one of changing environments, as the land was at times beneath the waters of the sea and at times existed probably as a swampy delta. In the sea waters limestone and shale were most commonly deposited, and in these layers we still find today remains of shell fish, corals, and other animals that lived in the ancient seas. The fresh water deposits were mainly sands and muds which exist today as layers of sandstone and shale without fossils except for occasional plant impressions and woody fragments.

This alternation of rock formations of different kinds has made it possible to subdivide the Chester into numerous subdivisions, the higher of which occur from Chester south and will be seen on this trip.

The formations exposed at the present stop are as follows:

Menard Formation (exposed in quarry).

Shale (at top of quarry): upper 18" ochre, limey, jammed with fossil bryozoa and brachiopods which weather free; lower 42", gray unfossiliferous.
Thickness, 5 feet.

Limestone: upper 52", massive, vary coarsely granular crinoidal, gray weathering to buff; middle 6 feet thin-bedded, brittle, gray, with thick partings of buff shale; lower 78" very light gray, massive, granular and oolitic, with chert bands.
Thickness, 16 feet, 10 inches.

Concealed, 18 inches.

Shale: top 8 feet, hard, gray, limey; lower 5 feet soft, dark gray; plus 2 feet of nodular clayey limestone at bottom. Thickness, 15 feet.

Limestone, pure coarsely granular, porous and somewhat oolitic, light gray. Thickness, 5 feet.

Menard Formation (exposed in bluff below quarry).

Limestone, in thick, rough layers, gray, mixed granular and dense. A characteristic fossil is the large razor clam, Sulcatopinna missouriensis (Swallow), which commonly lies in a vertical position, with pointed end downward, presumably as it lived, buried in the limey ooze. Other fossils common, including Spirifer, "Productus" and the snail, Bellerophon. Thickness, 15 feet.

Concealed, 12 feet.

Limestone, granular, clayey, in irregular, medium-thick layers. Fossils abundant near base: Spirifer, Composita, many kinds of bryozoa. Thickness, 10 feet.

Concealed, 30 inches.

Waltersburg Formation

Siltstone, greenish, rather massive. Thickness, 2 feet.

Concealed, 35 feet.

Vienna and Tar Springs Formations; covered by slope wash of 35 foot concealed interval.

Glen Dean Formation.

Limestone ledges, near road; granular, somewhat shaly, in thin layers. Many bryozoa, including the "cork-screw," Archimedes.

0.0 3.6 Continue ahead.

0.5 4.1 STOP No. 2. Opposite entrance road to quarry.

Quarry is in Menard Limestone, with the Sulcatopinna zone about the middle of the quarry face. Great slabs of limestone fallen from higher up, show surfaces of the ancient sea bottom, marked by Archimedes and many other forms of sea life. Stop to collect fossils.

0.0 4.1 Continue ahead.

0.6 4.7 STOP No. 3. Loess and soil zone exposed in pit at railroad cut.

During the Ice Age, continental ice sheets came down from the far north, notonce, but four distinctive times. The only one of the ice advances to reach as far as the Chester Area was the third or Illinois; this glacier coming down from the northeast, stopped just about on a line with the present Mississippi.

The clay, sand, and stones which all glaciers pick up and carry with them, are left behind when a glacier melts. Since we are here at the extreme edge of the Illinoian, it is likely that the ice was present only briefly and melted away rapidly. In any event the glacial debris, or till, is very thin here. It can be seen where washes have cut deeply into the floor of the pit. Note the pebbles of ancient crystalline rocks such as crop out many hundreds of miles north of this region around Lake Superior and in Canada.

Although only one ice sheet advanced as far as Chester, the Mississippi carried the floods from the melting of all of the glaciers and along with the melt water, loads of sediment as gravel, sand, and silt. The westerly winds picked up the silt from the mud flats of the great river and carried the dust eastward, where it came to rest as a heavy blanket of massive silt, called loess.

In the present pit there is a loess of Illinoian age (Loveland) forming the pit floor and showing its age by the high degree of weathering. Over this is another loess (Farmdale) which marks the state when the fourth, or Wisconsin Glacier, was advancing, and discharging water and sediment into the river. This loess is moderately weathered to a pink color and can be seen in the lower 14 feet of the pit face.

Above this pink loess is an ochre zone several feet thick in which fine, water-laid sand is interbedded with loess; woody fragments are common. Some time during the Wisconsin stage of glaciation a stream valley evidently crossed this place.

The last of the windblown deposits shown in the upper 15 feet of the pit face, is gray brown in color, and stands with the vertical face characteristic of loess. Shells of land snails are present in the deposit, which formed during later stages (Peorian) of Wisconsin glaciation.

0.0 4.7 Continue ahead.

0.3 5.0 Stop Sign; Route 3. Turn right (SE) on No. 3, and cross Railroad and Marys River.

2.5 7.5 STOP No. 4. Ravine in Chester formations.

Because the rock layers in the Chester Area dip slightly to the east, as we descend the river successively younger formations come down to the river level. The Menard Limestone which was seen at the top of the bluff at STOP No. 1 now lies close to road level, and above it as we ascend the ravine, we find the Palestine Sandstone, Clore Limestone, and Degonia Sandstone.

The strata exposed, beginning at the top are as follows:

Degonia Formation

Exposed in steep cliffs at the top of the bluff. Sandstone, light colored, medium grained, with clayey bands near base, massive above. Below lowest sandstone is 2 feet of gray shale. Thickness, 52 feet.

Concealed, 17 feet.

Bright green shale, weathered. Thickness, 6 feet.
Concealed, 10 feet.

Clore Formation.
Limestone and shale: upper 18" massive limestone, dense, hard, clayey, dark gray weathering buff; vertical fissures are filled with calcite; lower foot is granular limestone with giant Pentremites and other fossils; between is slaty hard gray shale.
Thickness, 9 feet.
Concealed, 6 feet.

Limestone and shale: 3 feet of soft, blue gray shale on slabby, hard, dense, gray limestone with partings of slabby, calcareous shale. Thickness, 8 feet.

Concealed interval, 37 feet. Evidently the stream has uncovered an old talus slope of huge blocks fallen from ledges of Clore limestone. Some blocks have a ropy surface made when the limestone sediment filled burrows in the underlying mud. Some blocks show abundant cup corals, others, giant Pentremites, others, brachiopods such as Composita and "Productus."

Palestine Formation.
Sandstone, light brown, fine-grained, firm, with cross-bedding, ripple marks, and hollow casts of shale pebbles. Thickness, 16½ feet.
Concealed, 2 feet.

Menard Formation.
Limestone and shale: 2½ feet of blue shale at top; below this, 10 feet of limestone, blue weathering buff, granular, breaking into large thin slabs. Near base is zone of black, shiny phosphate nodules, as well as some fish bones and many brachiopods, bryozoa, etc; below this, 4½ feet of blue gray shale with discontinuous layers of fossiliferous granular limestone; at bottom, about on level with road, 14 feet of limestone, dense to granular, gray weathering buff, in thick layers, including 2 feet of shale near middle.
Thickness, 31 feet.

0.0	7.5	Turn around and proceed NW on Route 3.
2.5	10.0	Recross Marys River and Railroad and continue ahead (NW) on No. 3.
2.1	12.1	Turn left on road to city park and stop.

STOP No. 5. The Mississippi River and flood plain can be seen in the distance, and beyond, the flat-topped upland on the Missouri side. On the Illinois side, the upland surface is similarily flat and rises to a height of from 600 to 700 feet above sea level.

Once, presumably in late Tertiary time (see geologic column), this upland level was a low plain worn by erosion down close to the level of the sea. This old erosion surface is called the Ozark Peneplain. Before the coming of the glaciers the whole region was uplifted some hundreds of feet and again erosion set to work carving out valleys and leaving ridges between. This work was interrupted temporarily by the invasion of the Illinoian ice on the Illinois side of the river, but the melting of the ice left only a thin drift sheet. This, with the overlying loess, had the effect merely of somewhat subduing the previous topography.

Today the streams are continuing their downward cutting. The ridges still are wider than the valleys, and for this reason the erosional process is said to be in a state of "early maturity."

In contrast to the gentle curves of the inland topography is the deep, straight wide gorge of the Mississippi with its fresh steep bluffs and short, rapidly eroding ravines. The bottom of the rock gorge actually lies several hundred feet deeper than the present floodplain, which has been built up to existing level by vast quantities of sediment washed down the gorge during successive stages of the Ice Age. Clearly the Mississippi gorge is something developed later than the topography of the region through which it has been slashed. It developed as the discharge channel for glacial waters coming from a vast region to the north, probably on the site of a pre-existing main stream that occupied a much smaller valley.

0.0	12.1	Continue ahead.
0.3	12.4	Three-way corner; turn sharp right and descend hill to
0.3	12.7	LUNCH STOP in city park.
0.0	12.7	Retrace route to
0.6	13.3	Route 3. Stop and turn left (NW) on No. 3.
0.7	14.0	Junction with Route 150 in Chester; turn right (NE) on 150-3.
0.2	14.2	Junction; continue ahead (NE) on Route 150.
0.9	15.1	Leave Chester on Route 150.
3.7	18.8	Cross Little Marys River at old covered bridge.
.7	20.5	Bremen.
.8	25.3	Junction with Route 43; continue ahead on Route 150.
.3	26.6	Cross Marys River.

0.8 27.4 Enter Steeleville.

1.1 28.5 Leave Steeleville.

0.5 29.0 Railroad crossing.

0.6 29.6 Route 150 bears left; continue ahead (E) on gravel road to Streamline Mine.

0.1 29.7 Turn right (S) on gravel road to Mine Office.

0.2 29.9 Office of Streamline Mine. Mine officials will conduct cars to working face in strip mine area to north.

STOP No. 6. Here the Herrin (No. 6) coal bed is being strip-mined. The Streamline Mine serves as an excellent example of use of modern mechanized strip mining methods. In strip-mining, the limiting factor is the amount of over-burden that overlies the coal. Here coal can be profitably mined under as much as 60 feet of over burden.

One of the problems in connection with strip-mining is the use or rehabilitation of mined out areas. In some regions these afford important recreational areas for hunting, fishing, boating, and swimming. Elsewhere, fruit orchards or timber trees are planted on the kulm piles. In the present case, pine plantations may be observed in the older portions of the mining area south of the washer unit.

The coal bed in the pit exceeds 6 feet in thickness and rests on a floor of soft, gray underclay. Above the coal is six feet of slaty, black, carbonaceous shale ("roof slate") which contains a peculiar circular phosphatic brachiopod (Orbiculoidea), microscopic shiny comb-like teeth (conodonts), and rarer bones and fin-spines of fish. This shale is believed to have been deposited in stagnant lagoons of salt or brackish water, that was poisonous except close to the surface where the fish (probably including the conodonts) swam. The Orbiculoidea may have been tough enough to tolerate the poisonous conditions of the bottom.

Over the roof slate is a massive five foot layer of very finely crystalline, dark gray limestone, full of marine fossils, especially the productid brachiopods: Juresania, Dictyoclostus, and Linoproductus, and the smaller, smooth, round Composita. Presumably a slight sinking of the land let in the waters of the open sea with its normal marine life.

The limestone deposition was followed by that of limey muds, also full of marine fossils, including mud-loving clams of many kinds and the snail, Bellerophon. The dark calcareous shale is 14 feet thick.

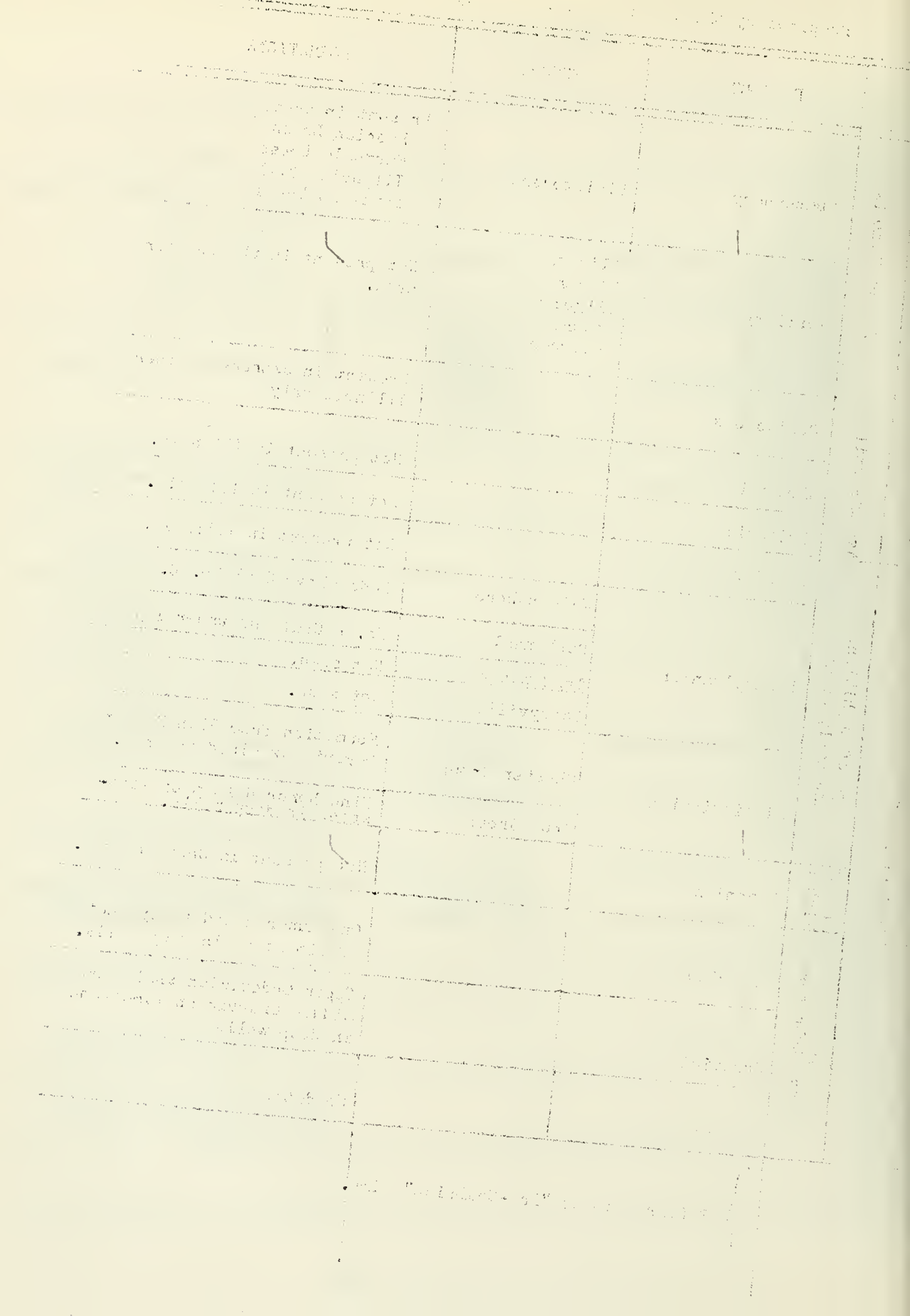
With a clearing of the waters, marine limestone, in this case lighter gray and fine-grained with streaks of ground-up shell matter, was deposited to a thickness of 4 feet. Fossils continue to be abundant, especially small brachiopods, Chonetes, Mesolobus, and Marginifera, as well as the butterfly-like Neospirifer and the productids. Crinoidal remains are also common.

Above the second limestone are from 10 to 20 feet of weathered ochre shales, overlain by about 4 feet of loess beneath the present soil zone.

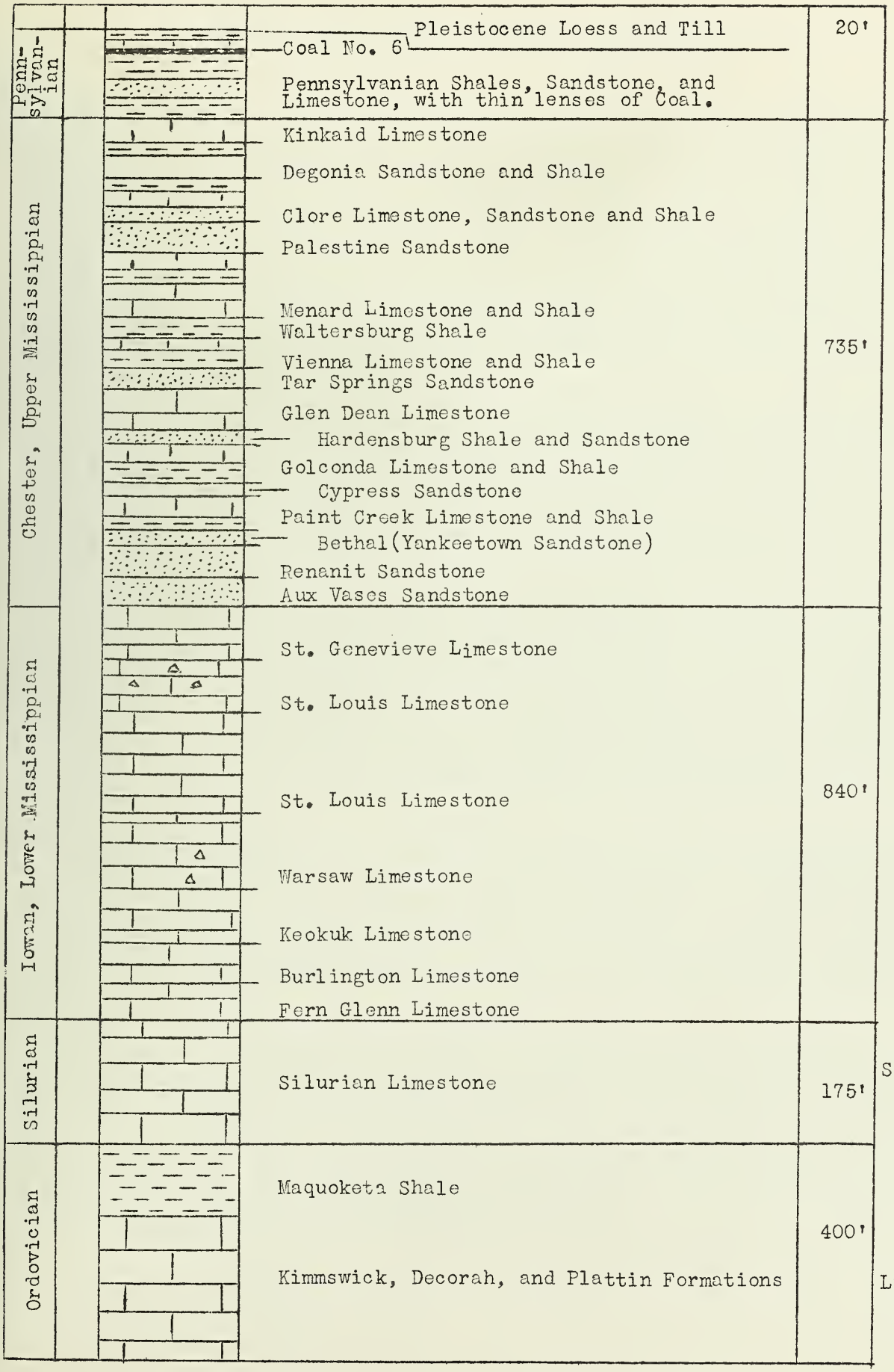
End of Field Conference.

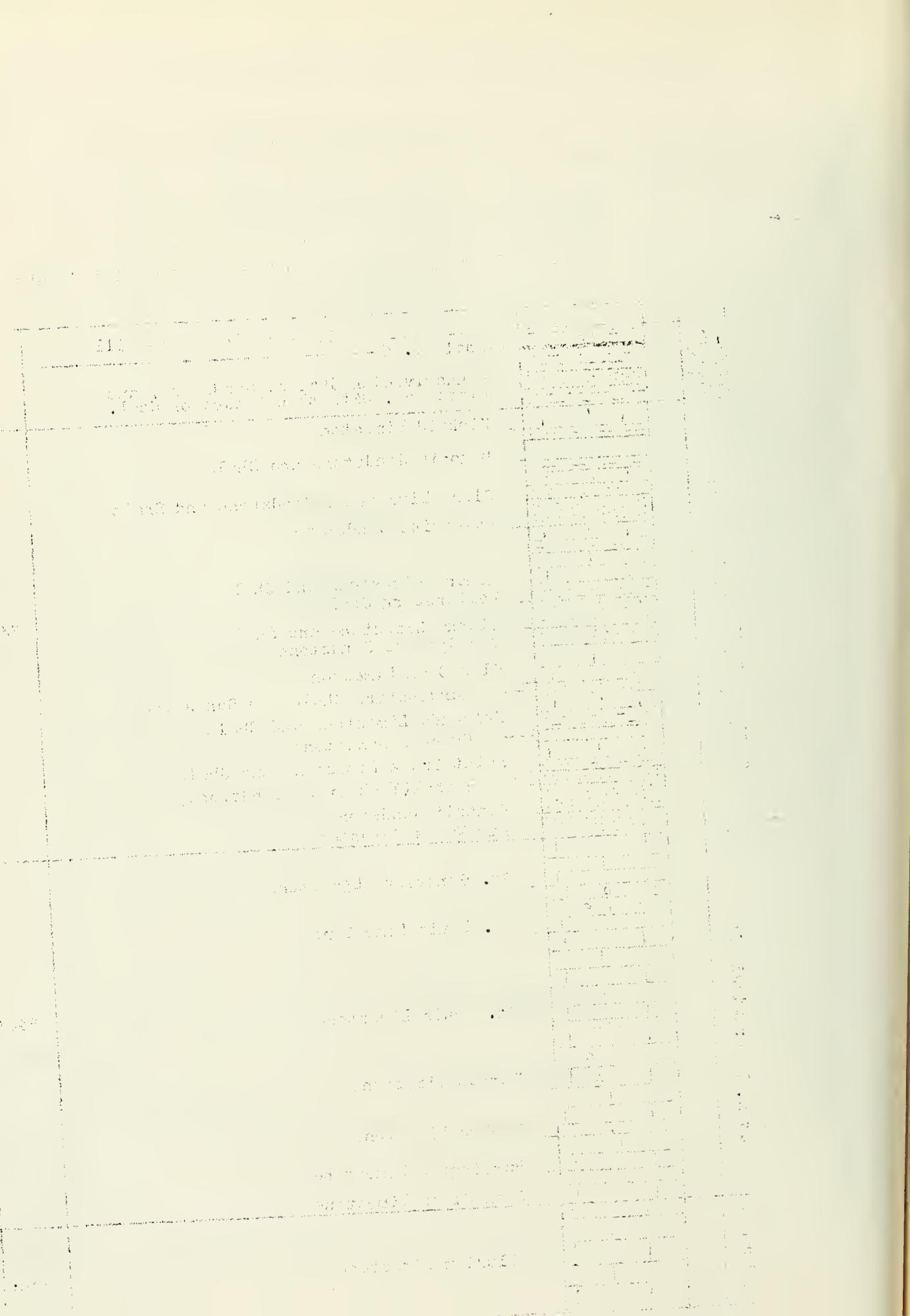
GENERALIZED GEOLOGIC COLUMN
FOR THE CHESTER AREA
Prepared by the Illinois State Geological Survey

ERAS		PERIODS	EPOCHS	FORMATIONS
Cenozoic "Recent Life"	Age of Mammals	Quaternary	Pleistocene	Present in area: Peorian Loess, Farmdale Loess, Illinoian Till, Loveland Loess
		Tertiary	Pliocene, Miocene, Oligocene, Eocene, Paleocene	Not present in the Chester area.
Mesozoic "Middle Life"	Age of Reptiles	Cretaceous		Present in extreme southern Illinois only
		Jurassic		Not present in Illinois.
		Triassic		Not present in Illinois.
Paleozoic "Ancient Life"	Age of Amphibians and Early Plants.	Permian		Not present in Illinois.
		Pennsylvanian	McLeansboro	Beds above Coal No. 6.
			Carbondale	No. 6 Coal and underclay
			Tradewater	Not seen.
			Caseyville	Not seen.
		Mississippian	Chester Group	Formation from Glen Dean to Degonia examined on trip.
			Iowa Group	Nine hundred feet of limestone in deep wells.
	Age of Fishes	Devonian		Not present in Chester area.
	Age of Invertebrates	Silurian		One hundred and fifty feet of limestone in deep wells.
		Ordovician		Upper Ordovician shale and Middle Ordovician limestone in deep wells.
		Cambrian		No data.
		} Referred to as "Pre-Cambrian" time.		



GENERALIZED GEOLOGIC COLUMN
Taken Largely from Two Deep Wells in Randolph County





PART II. GEOLOGICAL HISTORY OF THE CHESTER AREA

BEDROCK FORMATIONS.

The bedrock which lies at or close to the surface in the Chester Area belongs to the Mississippian Period (see geologic column) whereas that farther east about Steeleville belongs to the Pennsylvanian, or Coal Period. Deep wells drilled in Randolph County have revealed the presence of still older rocks below, of Silurian and Ordovician age. These beds come to the surface not far to the west in the Missouri Ozarks and are there found to lie upon still older rocks of Cambrian age. Nearly all of these layers which lie deeply buried in the Chester area were formed in ancient seas that invaded the interior of North America from 300 to 500 million years ago. Most of the layers are limestone with some shale and sandstone; the remains of various types of sea life are commonly found preserved in these very old rocks.

The deposits of these ancient seas lie upon still older rocks of Pre-Cambrian age, which come to the surface in the St. Francis Mountains of Missouri. These oldest of rocks are in large part granite and similar crystalline types, such as formed by cooling from a molten state deep beneath the earth's surface. They were uncovered by erosion before the ancient seas appeared in the Mississippi Valley. Only a few deep wells in Illinois reach down to these "basement" granites.

MISSISSIPPIAN HISTORY.

The ancient lime-depositing seas persisted into Mississippian time when thick limestone formations were laid down. These do not reach the surface in the Chester area but come up farther north along the river. Later in the Mississippian, movements of the earth's crust caused an alternation of marine and fresh water conditions, so that at times marine limestones and shales were laid down and at other times fresh water sands and muds were deposited and later hardened to sandstone and shale. The freshwater deposits are without fossils except for the trunks, stems, and leaves of plants that were washed from the land.

PENNSYLVANIAN HISTORY.

By Pennsylvanian time the seas only rarely reached the region, and most of the deposits were formed on the land or in freshwater. High mountains comparable to the present Andes, were rising near the Atlantic Coast. Between the mountains and the inland seas which lay off to the west in Nebraska, Kansas, and Oklahoma, extended a low, hot, swampy plain crossed by rivers moving from the mountains to the sea. The region might be compared roughly to the Amazon basin which lies to the east of the Andes.

At times the sinking of the lowland permitted the sea to extend far to the east and deposit fossiliferous limestone and shale over Illinois. At other times vast jungle swamps accumulated dense vegetation, which, falling in the poisonous waters, was preserved from complete decay to form our valuable coal beds. But for the most part, the low land was occupied by rivers, shallow lakes, and bayous in which mud and sand, washed out from the mountains, came to rest to form shale and sandstone. The piling up of thousands of feet of this sediment helped to compress the peaty layers of vegetation into coal.

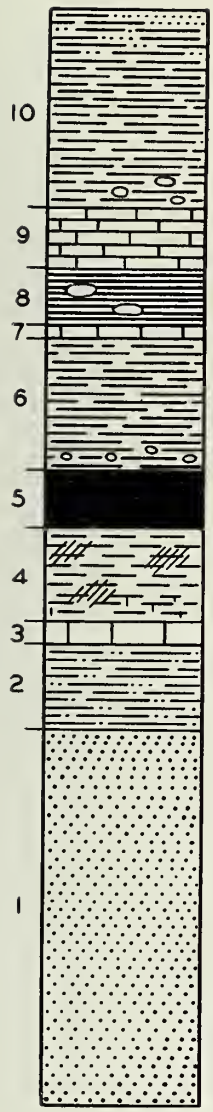
THE LOST INTERVAL.

Following Pennsylvanian time, the land rose to a moderate elevation above the sea and apparently was never again covered by marine waters. Under these conditions, erosion by streams and the weather slowly cut down the land, and in the Chester area in places cut away all of the Pennsylvanian formations down to the Chester rock. The disintegrated rock was carried away as sand, gravel, and mud by streams and rivers, to be deposited in areas remote from this region. Thus it is that we have no direct evidence of the life and environment here dur- the Age of Reptiles and the Age of Mammals that followed.

ICE AGE HISTORY.

The glaciers which relatively recently moved down into Illinois from the far north wrote the last chapter of the geologic history of the region. During the Pleistocene period (or Ice Age), glaciers invaded Illinois, not merely once, but four times, and each ice invasion was separated from the next by a long mild interval of 100 to 300 thousand years. During these mild intervals plant and animal life returned, soils formed, and conditions were not greatly different from what they are today. In fact, there is no way of knowing but what we are living today in just such an interval that will be terminted a few hundred thousand years hence by a fifth ice advance.

Only one of the glaciations, the third or Illinoian, reached the Chester region, but glacial conditions farther north effected the climate, geology, and topography in the Chester area, especially through the agency of the Mississippi. The great river carried the melt waters and the sediments from the wasting glaciers farther north, and was the source of the loess, blown from the river flats onto the uplands to the east.



10. Shale, gray, sandy at top; contains marine fossils and ironstone concretions especially in lower part.

9. Limestone; contains marine fossils.

8. Shale, black, hard, laminated; contains large spheroidal concretions ("Niggerheads") and marine fossils.

7. Limestone; contains marine fossils.

6. Shale, gray; pyritic nodules and ironstone concretions common at base; plant fossils locally common at base; marine fossils rare.

5. Coal; locally contains clay or shale partings.

4. Underclay, mostly medium to light gray except dark gray at top; upper part noncalcareous, lower part calcareous.

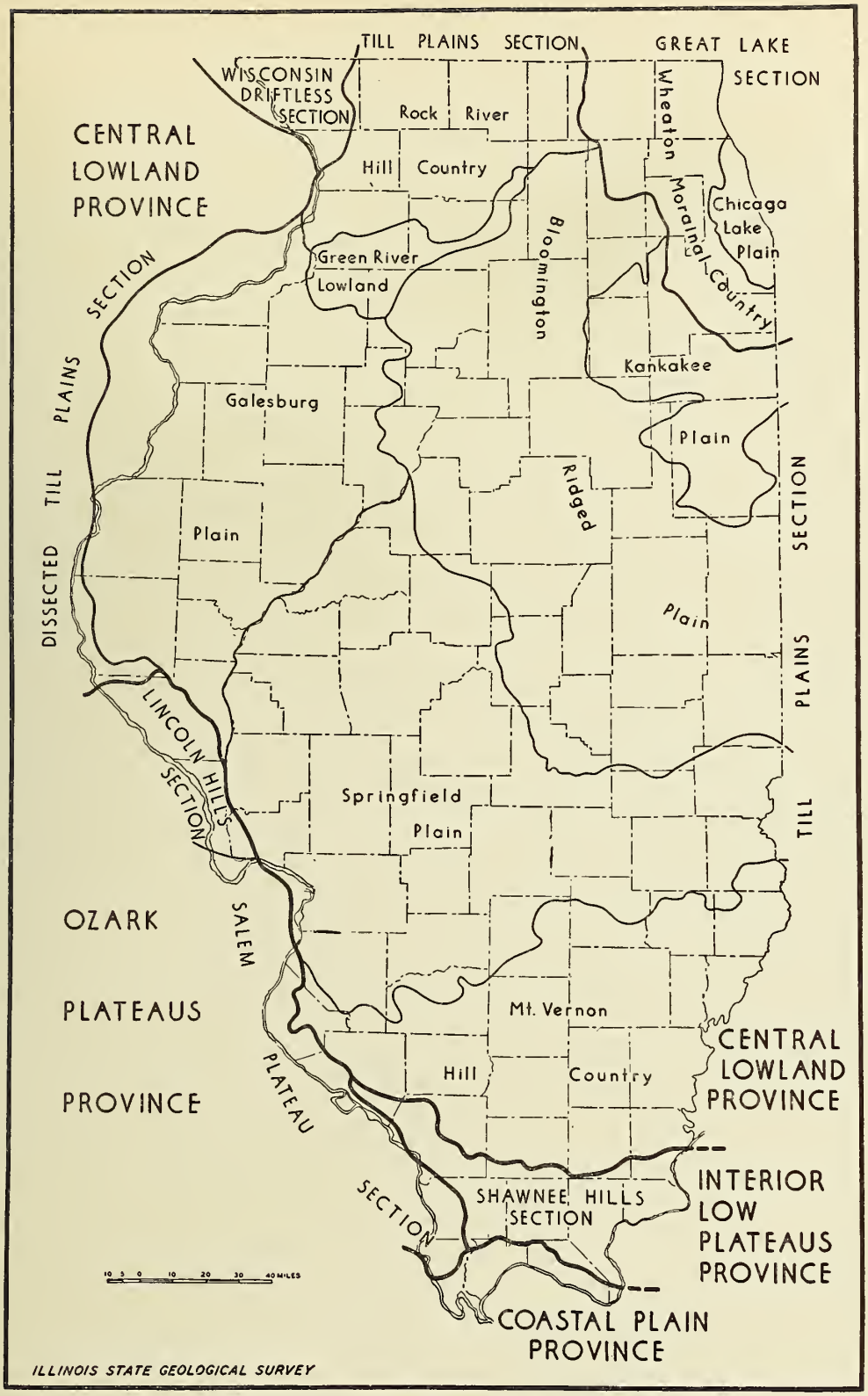
3. Limestone, argillaceous; occurs in nodules or discontinuous beds; usually nonfossiliferous.

2. Shale, gray, sandy.

1. Sandstone, fine-grained, micaceous, and siltstone, argillaceous; variable from massive to thin-bedded; usually with an uneven lower surface.

AN IDEALLY COMPLETE CYCLOTHEM

(Reprinted from Fig. 42, Bulletin No. 66, Geology and Mineral Resources of the Marseilles, Ottawa, and Streator Quadrangles, by H. B. Willman and J. Norman Payne)



PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Report of Investigations No. 129, Physiographic Divisions of Illinois, by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

BARKLEY

HEAVY WEIGHT

STOCK NO. 5412 1/3